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Form Approved OMB No. 0704-0188

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1. REPORT DATE (<i>DD-MM-YYYYY</i>) 21-09-2007 2. REPORT TYPE Final Report					3. DATES COVERED (From – To) 1 July 2006 - 01-Jul-07	
4. TITLE AND SUBTITLE				5a. CC	5a. CONTRACT NUMBER	
Studies of electron-ion interactions using the CRYRING heavy-ion storage ring					FA8655-06-1-3061	
facility				5b. GR	5b. GRANT NUMBER	
				5c PR	ROGRAM ELEMENT NUMBER	
					CONAIN ELEMENT NOMBER	
6. AUTHOR(S)				5d. PF	5d. PROJECT NUMBER	
Professor Mats Larsson						
					5d. TASK NUMBER	
				5e. W	5e. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)					8. PERFORMING ORGANIZATION	
Stockholm University SCFAB					REPORT NUMBER	
Stockholm SE-106 91					N/A	
Sweden						
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9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)					10. SPONSOR/MONITOR'S ACRONYM(S)	
EOAF						
Unit 4515 BOX 14 APO AE 09421					11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
AL ONE 00421					Grant 06-3061	
12. DISTRIBUTION/AVAILABILITY STATEMENT						
Approved for public release; distribution is unlimited.						
13. SUPPLEMENTARY NOTES						
14. ABSTRACT						
This report results from a contract tasking Stockholm University as follows: The Grantee will investigate the measurements of branching						
ratios in recombination of polyatomic molecular ions. It is proposed to study not only the rates of dissociative recombination of ions important						
for plasma-enhanced combustion but also the neutral product distributions. Deuterated molecules and peak fitting procedures will be applied to enhance the resolution. The proposed measurements will add greatly to the knowledge base in this unexplored field, yielding answers to						
the questions outlined above and serving as important inputs to the Air Force combustion models.						
15. SUBJECT TERMS FOARD Combustion Incomprise Chamistry Malacular Chamistry						
EOARD, Combustion, Inorganic Chemistry, Molecular Chemistry						
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF	18, NUMBER	19a. NAME OF RESPONSIBLE PERSON	
a. REPORT	b. ABSTRACT	c. THIS PAGE	ABSTRACT UL	OF PAGES	BARRETT A. FLAKE	
UNCLAS	UNCLAS UN	UNCLAS			19b. TELEPHONE NUMBER (<i>Include area code</i>) +44 (0)1895 616144	

EORD/Contracting Office 223/231 Old Marylebone Road London NW1 5TH United Kingdom

Contract FA8655-06-1-3061; final report

Period: 20060701 - 20070630

This is the final report for contract FA8655-06-1-3061. During the contract period, two weeks of beam time at CRYRING have been used.

The first experiment concerned $C_4D_2^+$, and we measured the dissociative recombination cross section and the product branching ratios. The experiment worked fine and we were able to obtain all the data we had planned to obtain. The data are presently being reduced, and a publication will be written in August 2007.

The second experiment concerned POCl⁺ and POCl₂⁺. For POCl⁺ we managed to measure both recombination cross section and product branching ratios. The experiment on POCl₂⁺ was very difficult because the mass of this ion is close to the upper mass limit that can be handled in CRYRING. We were only able to obtain the cross section for POCl₂⁺, not the product branching ratios. The experiment was a success, and the data are now being reduced. A paper will be written within shortly.

The third delivery during the period is the development of a database for dissociative recombination. This is the first time this has been done, and it is in line with the worldwide efforts to develop databases for atoms. The PI presented the new database as a poster at the ICAMDATA 2006 (International Conference on Atomic and Molecular Data) in Meudon, France, in October 2006. The database is available at http://mol.physto.se/DRdatabase/. It should be noted that the database is not yet fully debugged.

The fourth delivery is a publication concerning two of the molecules listed in the application from 2006:

Ehlerding, A., Viggiano, A.A., Hellberg, F., *et al.* 2006, "The dissociative recombination of fluorocarbon ions III: CF_2^+ and CF_3^{++} ", *J. Phys. B* **39**, pp. 805–812.

The dominant decays channels in $CF_{2,3}^+ + e$ were found to be CF + F and $CF_2 + F$. The cross sections for dissociative recombination were very similar.

Sincerely,

Mats Larsson